

WHAT IS CLAIMED IS:

1. A plasma treatment apparatus comprising:

5 a gas supply means for introducing a processing gas into a space between a first electrode and a second electrode under an atmospheric pressure or around atmospheric pressure;

a plasma generation means for generating plasma by applying a high frequency voltage to the first electrode or the second electrode under the condition that the processing gas is introduced; and

10 a transport means for transporting while floating the object to be treated is transported by floating the object to be treated by blowing the processing gas or a transporting gas to the object to be treated,

wherein an etching treatment; an ashing treatment; or a thin film formation is carried out by transferring a relative position of the first electrode and the second electrode, and the object to be treated.

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2. A plasma treatment apparatus according to claim 1, wherein a distance between the object to be treated, and the first electrode and the second electrode are arranged by blowing and sucking the transporting gas simultaneously.

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3. A plasma treatment apparatus according to claim 1, wherein a heating means that heats the processing gas and the transporting gas is provided.

4. A plasma treatment apparatus according to claim 1, wherein the first electrode and the second electrode are separated from an outside by the transport

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means.

5        5. A plasma treatment apparatus according to claim 1, wherein the object to be treated is one selected from a glass substrate; a resin substrate; and a semiconductor substrate.

6. A plasma treatment apparatus according to claim 1, wherein the processing gas is a mixed gas containing a source gas of  $\text{Si}_x\text{H}_y$  and  $\text{SiH}_x\text{Cl}_y$ ; one of hydrogen, oxygen, and nitrogen; and a rare gas.

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7. A plasma treatment apparatus according to claim 1, wherein the processing gas is a mixed gas containing a source gas of  $\text{NF}_3$ , fluorocarbon,  $\text{SF}_6$ , and  $\text{CO}_x$ ; one of hydrogen and oxygen; and a rare gas.

15        8. A plasma treatment apparatus according to claim 1, wherein the processing gas is oxygen, and one of hydrogen, fluorocarbon,  $\text{NF}_3$ ,  $\text{H}_2\text{O}$  and  $\text{CHF}_3$ .

9. A plasma treatment apparatus comprising:

20        a gas supply means for introducing a processing gas into a space between a first electrode and a second electrode under an atmospheric pressure or around atmospheric pressure ;

      a plasma generation means for generating plasma by applying a high frequency voltage to the first electrode or the second electrode under the condition that the processing gas is introduced; and

25        a transport means for transporting while floating the object to be treated is

transported by floating an object to be treated by blowing the processing gas or a transporting gas to the object to be treated,

wherein a cleaning treatment of a component is carried out by using the first electrode and the second electrode.

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10. A plasma treatment apparatus according to claim 9, wherein a distance between the object to be treated, and the first electrode and the second electrode are arranged by blowing and sucking the transporting gas simultaneously.

10 11. A plasma treatment apparatus according to claim 9, wherein a heating means that heats the processing gas and the transporting gas is provided.

12. A plasma treatment apparatus according to claim 9, wherein the first electrode and the second electrode are separated from an outside by the transport  
15 means.

13. A plasma treatment apparatus according to claim 9, wherein the object to be treated is one selected from a glass substrate; a resin substrate; and a semiconductor substrate.

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14. A plasma treatment apparatus according to claim 9, wherein the processing gas is a mixed gas containing a source gas of  $\text{Si}_x\text{H}_y$  and  $\text{SiH}_x\text{Cl}_y$ ; one of hydrogen, oxygen, and nitrogen; and a rare gas.

25 15. A plasma treatment apparatus according to claim 9, wherein the processing

gas is a mixed gas containing a source gas of  $\text{NF}_3$ , fluorocarbon,  $\text{SF}_6$ , and  $\text{CO}_x$ ; one of hydrogen and oxygen; and a rare gas.

16. A plasma treatment apparatus according to claim 9, wherein the processing  
5 gas is oxygen, and one of hydrogen, fluorocarbon,  $\text{NF}_3$ ,  $\text{H}_2\text{O}$  and  $\text{CHF}_3$ .

17. A plasma treatment apparatus comprising:

a gas supply means for introducing a processing gas into a space between a first electrode and a second electrode under an atmospheric pressure or around  
10 atmospheric pressure;

a plasma generation means for generating plasma by applying a high frequency voltage to the first electrode or the second electrode under the condition that the processing gas is introduced; and

a transport means for transporting while floating an object to be treated is  
15 transported by floating the object to be treated by blowing the processing gas or a transporting gas to the object to be treated,

wherein an etching treatment; an ashing treatment; or a thin film formation is carried out by transferring a relative position of the first electrode and the second electrode, and the object to be treated, and

20 wherein the first electrode is formed surrounding the periphery of the second electrode, and formed in a cylindrical shape having the gas supply port of a nozzle shape at its edge.

18. A plasma treatment apparatus according to claim 17, wherein a distance  
25 between the object to be treated, and the first electrode and the second electrode are

arranged by blowing and sucking the transporting gas simultaneously.

19. A plasma treatment apparatus according to claim 17, wherein a heating means that heats the processing gas and the transporting gas is provided.

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20. A plasma treatment apparatus according to claim 17, wherein the first electrode and the second electrode are separated from an outside by the transport means.

10 21. A plasma treatment apparatus according to claim 17, wherein the object to be treated is one selected from a glass substrate; a resin substrate; and a semiconductor substrate.

22. A plasma treatment apparatus according to claim 17, wherein the  
15 processing gas is a mixed gas containing a source gas of  $\text{Si}_x\text{H}_y$  and  $\text{SiH}_x\text{Cl}_y$ ; one of hydrogen, oxygen, and nitrogen; and a rare gas.

23. A plasma treatment apparatus according to claim 17, wherein the  
processing gas is a mixed gas containing a source gas of  $\text{NF}_3$ , fluorocarbon,  $\text{SF}_6$ , and  
20  $\text{CO}_x$ ; one of hydrogen and oxygen; and a rare gas.

24. A plasma treatment apparatus according to claim 17, wherein the processing gas is oxygen, and one of hydrogen, fluorocarbon,  $\text{NF}_3$ ,  $\text{H}_2\text{O}$  and  $\text{CHF}_3$ .

25 25. A plasma treatment apparatus comprising:

a gas supply means for introducing a processing gas into a space between a first electrode and a second electrode under an atmospheric pressure or around atmospheric pressure ;

a plasma generation means for generating plasma by applying a high  
5 frequency voltage to the first electrode or the second electrode under the condition that the processing gas is introduced; and

a transport means for transporting while floating an object to be treated is transported by floating an object to be treated by blowing the processing gas or a transporting gas to the object to be treated,

10 wherein a cleaning treatment of a component is carried out by using the first electrode and the second electrode, and

wherein the first electrode is formed surrounding the periphery of the second electrode, and formed in a cylindrical shape having the gas supply port of a nozzle shape at its edge.

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26. A plasma treatment apparatus according to claim 25, wherein a distance between the object to be treated, and the first electrode and the second electrode are arranged by blowing and sucking the transporting gas simultaneously.

20 27. A plasma treatment apparatus according to claim 25, wherein a heating means that heats the processing gas and the transporting gas is provided.

28. A plasma treatment apparatus according to claim 25, wherein the first electrode and the second electrode are separated from an outside by the transport  
25 means.

29. A plasma treatment apparatus according to claim 25, wherein the object to be treated is one selected from a glass substrate, a resin substrate and a semiconductor substrate.

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30. A plasma treatment apparatus according to claim 25, wherein the processing gas is a mixed gas containing a source gas of  $\text{Si}_x\text{H}_y$  and  $\text{SiH}_x\text{Cl}_y$ ; one of hydrogen, oxygen, and nitrogen; and a rare gas.

10 31. A plasma treatment apparatus according to claim 25, wherein the processing gas is a mixed gas containing a source gas of  $\text{NF}_3$ , fluorocarbon,  $\text{SF}_6$ , and  $\text{CO}_x$ ; one of hydrogen and oxygen; and a rare gas.

15 32. A plasma treatment apparatus according to claim 25, wherein the processing gas is oxygen, and one of hydrogen, fluorocarbon,  $\text{NF}_3$ ,  $\text{H}_2\text{O}$  and  $\text{CHF}_3$ .

33. A method for plasma treatment comprising the steps of:

introducing a processing gas into a space between a first electrode and a second electrode under an atmospheric pressure or around atmospheric pressure ;

20 generating plasma by applying a high frequency voltage to the first electrode or the second electrode under the condition that the processing gas is introduced; and

transferring an object to be treated with being floated by blowing the processing gas or a transporting gas to a substrate to be treated,

25 wherein an ashing treatment; or a thin film formation is carried out by transferring a relative position of the first electrode and the second electrode, and the

object to be treated.

34. A method for plasma treatment comprising the steps of:

introducing a processing gas into a space between a first electrode and a  
5 second electrode under an atmospheric pressure or around atmospheric pressure;  
generating plasma by applying a high frequency voltage to the first electrode  
or the second electrode under the condition that the processing gas is introduced; and  
transferring an object to be treated with being floated by blowing the  
processing gas or a transporting gas to the object to be treated,  
10 wherein a cleaning treatment of a component is carried out by the first  
electrode and the second electrode.

35. A method for manufacturing a thin film transistor, comprising the steps of:

forming a gate electrode over a substrate having a insulating surface;  
15 forming a gate insulating film over the substrate;  
forming an amorphous semiconductor film over the gate insulating film;  
forming a crystalline semiconductor film by crystallizing the amorphous  
semiconductor film; and  
forming a insulating film over the crystalline semiconductor film,  
20 wherein a processing gas is introduced into a space between a first electrode  
and a second electrode of a plasma apparatus under an atmospheric pressure or  
around atmospheric pressure for generating plasma by applying a high frequency  
voltage to the first electrode or the second electrode.

25 36. A method for manufacturing a thin film transistor, comprising the steps of:



- forming a gate electrode over a substrate having a insulating surface;
  - forming a gate insulating film over the substrate;
  - forming an amorphous semiconductor film over the gate insulating film; and
  - forming a insulating film over the amorphous semiconductor film,
- 5        wherein a processing gas is introduced into a space between a first electrode and a second electrode of a plasma apparatus under an atmospheric pressure or around atmospheric pressure for generating plasma by applying a high frequency voltage to the first electrode or the second electrode.